June 18, 1998

Mr. John Sampson
Site Vice President
Nuclear Generation Group
American Electric Power Company
500 Circle Drive
Buchanan, MI 49107-1395

SUBJECT: NRC INSPECTION REPORT 50-315/98010(DRS); 50-316/98010(DRS)

Dear Mr. Sampson:

On May 21, 1998, the NRC completed an inspection of your examinations of the part length control rod housings (PLCH) at the D. C. Cook Nuclear Power Station Units 1 and 2. The enclosed report presents the results of that inspection.

Areas examined within the PLCH examination program are identified in the report. Within those areas, the inspection consisted of a selective examination of procedures and representative records, interviews with personnel, and observation of activities in progress. The objective of the inspection effort was to determine whether activities authorized by the license were conducted in accordance with NRC requirements. Based on the results of this inspection, no violations of NRC requirements were identified.

Our inspection identified a number of strengths in the PLCH examination program. For example, the ultrasonic demonstration of examination detection capability for the PLCH was performed at the Electric Power Research Institute Nondestructive Examination Center. This demonstration was attended by the NRC and substantiated the effectiveness of the ultrasonic procedure. A mockup which contained fabricated flaws, of various size, representative of those found in the leaking PLCH at Prairie Island, was used in the demonstration. Prior to this demonstration a number of utilities had performed ultrasonic examination to their PLCHs; however, no validation of the ultrasonic examination procedures capabilities had been performed. Your decision to perform this validation of the ultrasonic examination procedure detection capability, independent of industry cooperation, shows a positive commitment to safety.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, and the enclosure to this letter will be placed in the NRC Public Document Room.

Sincerely,

Original /s/ J. A. Grobe

John A. Grobe, Director
Division of Reactor Safety

Docket Nos.: 50-315; 50-316
License Nos.: DPR-58; DPR-74

Enclosure: Inspection Report 50-315/98010(DRS);
50-316/98010(DRS)

cc w/encl: Don Hafer, Acting Chief
Nuclear Engineer
Douglas Cooper, Plant Manager
Richard Whale, Michigan Public
Service Commission
Michigan Department of
Environmental Quality
Emergency Management Division,
MI Department of State Police
David A. Lochbaum, Union
of concerned Scientists

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U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-315; 50-316
License Nos:	DPR-58; DPR-74
Report Nos:	50-315/98010(DRS); 50-316/98010(DRS)
Licensee:	Indiana Michigan Power Company
Facility:	Donald C. Cook Nuclear Plant, Units 1 & 2
Location:	1 Cook Place Bridgman, MI 49106
Dates:	April 14-16, 28-29, May 14, 21, 1998
Inspectors:	J. F. Schapker, Reactor Engineer
Approved by:	J. A. Gavula, Chief, Engineering Specialists Branch 1 Division of Reactor Safety

EXECUTIVE SUMMARY

D. C. Cook Nuclear Plant, Units 1 & 2
NRC Inspection Reports 50-315/98010; 50-316/98010

This inspection reviewed the examination of the part length control rod housings. This was an announced inspection conducted by one regional inspector. The following strengths were identified:

- The independent determination of the ultrasonic examination capability for the part length control rod housings was considered a sound engineering decision. Since other sites had previously performed comparable inspections without this determination, the licensee demonstrated a positive commitment to safety.

- Examinations of the Unit 2 part length control rod housings were accomplished in accordance with the Electric Power Research Institute demonstrated procedure, using the same equipment and essential variables.

Report Details

III. Maintenance

M1 Conduct of Maintenance

M1.1 Observation of Inservice Inspection Activities

a. Inspection Scope (73753/73755)

The inspector observed the ultrasonic examination demonstration at Electric Power Research Institute (EPRI) and reviewed the recorded Unit 2 part length control rod housing (PLCH) examination data.

b. Observations and Findings

On January 24, 1998, Prairie Island Unit 2, a Westinghouse Electric Corporation (WEC) designed reactor, was shutdown due to a leak identified in the PLCH number G-9. The leak was located in the bimetallic lower weld of the PLCH. The part length control rods are no longer used and were abandoned in place. The PLCH's were fabricated from Type 403 martensitic and Type 304 austenitic stainless steel. An austenitic buttering was applied to the martensitic stainless steel portion of the housing followed by the full penetration welding (with an austenitic weld) to the austenitic portion of the housing. There were two welds per PLCH with this design and four to eight installed on the reactor vessel head, depending on the number of reactor coolant loops. D.C. Cook is a four-loop plant and has eight PLCHs' per unit. Metallurgical examination of the Prairie Island PLCH weld identified a fabrication flaw as the cause of the leak. No evidence of inservice degradation was identified.

The licensee contacted the Nuclear Regulatory Commission (NRC) Region III concerning the demonstration of an ultrasonic examination (UT) procedure for the PLCH bimetallic weld. The purpose of this demonstration was to evaluate the detection capability of the UT procedure. This procedure was developed by ABB-Combustion Engineering (ABB/CE) and had been previously used at several plants. However, no validation of the UT procedure had been demonstrated, and the NRC/ Nuclear Regulatory Regulation (NRR) had previously questioned the minimum detectable flaw size the procedure was capable of detecting and the probability of detection.

The demonstration was performed on a spare PLCH which was purchased by the licensee and modified by Flaw Tech Inc. to include representative imbedded planar flaws (fatigue cracks), three circumferentially oriented, and one axially oriented, in each weld (upper and lower welds). The upper weld contained circumferential flaws with dimensions of 50%, 45%, 15% through wall, 1 inch, 0.796 inch, and 0.627 inch in length respectively, and an axial flaw 30% through wall at 0.296 inch in length. The lower weld (which the G-9 PLCH experienced the leak) contained circumferential flaws of 59%, 48% and 15% through wall, 1.116 inch, 1.245 inch and .0767 inch in length, and an axial flaw at 41% through wall, 1 inch in length.

The inspector observed the demonstration which utilized an automated ultrasonic examination system using the “IntraSpect Automated Imaging System.” The examination procedure utilized 45-degree shear wave, and a 45-degree long wave for the lower weld axial scans. A 35-degree long wave was used for the circumferential scan. The upper weld was scanned with a 60-degree long wave transducer using the long wave when scanning from the martensitic side (up) and the shear component (26-degree) from the austenitic (down) direction. The nominal frequency for all examinations was 4.0 megahertz (MHZ) for all axial longitudinal scans, and 2.25 MHZ for circumferential scans. Scanning was at less than 2 inches per second. Couplant was deionized water.

The ultrasonic examination demonstration identified all of the circumferential oriented flaws in excess of 45% through wall. None of the 15% circumferential or axial oriented flaws were detected. The axial flaws were not representative of the flaw orientation experienced in the G-9 PLCH, but were included in an attempt to demonstrate the capability to perform an ASME Code examination. The flaws were conservatively and accurately sized.

The flaws greater than 45% were easily detected, and the contractor believed there was a possibility that the 15% circumferential flaws could have been partially consumed by the installation of the flaw welding. There were no flaws installed in the mockup between 15% and 45% in the circumferential flaw plane. Therefore, the minimum detectibility demonstrated at the first demonstration was greater than 45% for circumferentially oriented flaws. Consequently, the licensee decided to modify the mockup with additional flaws, in the circumferential plane, with through wall dimensions of 25%, 35%, and 45% to establish the minimum detectibility of the UT procedure. In addition, removal and destructive examination of one of the 15% flaws was performed to verify actual flaw size. However, the destructive examination verified the 15% flaw had not been consumed by the installation welding, and therefore, the detection capability of the UT procedure was greater than 15% through-wall. ABB/CE also pursued additional data from the Prairie Island G-9 PLCH, for which WEC had performed a metallurgical investigation and root cause assessment (the contractor also examined the G-9 using the same UT procedure prior to the metallurgical examination performed by WEC).

The inspector observed the second demonstration which was performed with the modified mockup. The UT contractor demonstrated the ability to detect all of the 25%, 35% and 45% circumferentially oriented planar flaws. This demonstration confirmed a minimum flaw detectibility of 25% through-wall.

The inspector’s observations of the UT data for the D.C. Cook, Unit 2 PLCH’s was performed by review of the digitally recorded data and verified that there were no indications in excess of those identified in the performance demonstration. One small indication plotted at midwall of the F-12 PLCH was detected. This indication was located in the 304 stainless steel base metal side of the weld (not in the area of the weld buttering where the Prairie Island flaw was located), and was not a surface-connected indication. The indication appeared similar to be a small inclusion (approximately 0.100" in length).

The inspector conferred with NRR during the course of the inspection and attended the Westhinghouse Owners Group/Regulatory Response Group meeting on May 5, 1998, to discuss the status of the investigation into the Prairie Island PLCH flaw root cause and recommended action.

c. Conclusions

The inspector's observation of the UT performance demonstration confirmed the adequacy of the UT examination to identify circumferentially oriented flaws in excess of 25% through-wall. Review of the UT data, reproduced from digitally recorded data, confirmed the Unit two PLCH's bimetallic welds did not have any detectable flaws in excess of those demonstrated at EPRI. The licensee used sound engineering judgement in electing to perform the UT procedure demonstration.

M3 Maintenance Procedures and Documentation

M3.1 Review of Nondestructive Examination Procedures and Data

a. Inspection Scope (73052,73755)

The inspector reviewed the ultrasonic procedure and UT data.

b. Observations and Findings

The UT procedure was documented and performed as demonstrated at EPRI. Recording of the UT data on a digital disc and on hard copy forms was accomplished as required by procedure 12 EHP SP.091, revision 0, "Intraspect Ultrasonic Imaging System Procedure for Detection of Planar Flaws Originating in Part Length Control Rod Drive Pressure Housings at the D.C. Cook Nuclear Power Plant."

c. Conclusion

The UT procedure and data documentation was completed in accordance with the performance demonstrated procedure and PMI-2011 "Procedure Use and Adherence."

V. Management Meetings

XI Exit Meeting Summary

After the Unit 1 PLCH examinations were delayed due to temperature limitations, on May 21, 1998, the inspector presented the inspection results to licensee management. The licensee acknowledged the findings presented. The inspector asked the licensee whether any material examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

M. Acterman, Nuclear Licensing
K. Baker, Plant Engineering
P. Barratt, Performance Assurance
D. Cooper, Plant Manager
M. Depuydt, Nuclear Licensing
K. Worthington, ISI Engineer
B. Mickatavich, Maintenance Engineer

ABB/Combustion Engineering (CE)

J. Lareau, Senior Technical Advisor
N. Siniaho, Project Manager

Electric Power Research Institute (EPRI)

J. Landrum, Project Manager
D. MacDonald, Principal Engineer

U.S. Nuclear Regulatory Commission (NRC)

B. Bartlett, Senior Resident Inspector
B. Fuller, Resident Inspector
B. Herman, Senior Level Scientist, NRR
E. Sullivan, Chief, Materials and Chemical Engineering Br., NRR

INSPECTION PROCEDURES USED

IP73753: Observations of ISI Activities
IP73052: Review of ISI procedures
IP73755: Review of ISI data

ITEMS OPENED, CLOSED, AND DISCUSSED

None

LIST OF ACRONYMS USED

EPRI	Electric Power Research Institute
MHZ	Megahertz
NDE	Nondestructive Examination
NRC	Nuclear Regulatory Commission
NRR	Nuclear Regulatory Regulation
PLCH	Part length control rod housing
UT	Ultrasonic Examination
WEC	Westinghouse Electric Corporation
WOG	Westinghouse Owners Group